Climate and jellyfish outbreaks in the Mediterranean Sea

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Jellyfish are critical components of marine ecosystems. Whether variations in their population size are driven by human- or climate-mediated processes is a matter for current debate and a challenge in biological oceanography. Here we gathered pluriannual information of Mediterranean jellyfish to synthesize basin scale trends of jellyfish outbreaks, their strength and frequency, over the last decades, and to quantify their potential link with Hemispheric-wide climate forcing. Through a downscaling and meta-analysis approach we quantified leading interactions between Hemispheric-wide climatic modes and regional atmospheric indices across the Mediterranean basin and tested whether the temporal dynamics of jellyfish outbreaks are consistent with the climate-related environmental changes the Mediterranean Sea undergone during the last decades. We provide quantitative evidence that jellyfish populations integrate climate related changes in the Mediterranean basin, with close correlations between climate variations and their outbreaks dynamics. Also, we identified threshold values from which climate effects on jellyfish become noticeable, suggesting that the climate – jellyfish relationship raises according to the strength of climate forcing. Our results support the occurrence of short time windows, during which jellyfish population may be more sensitive to climate variations, and environmental conditions during such periods may substantially increase or impair jellyfish outbreaks. The possibility of using the jellyfish outbreak dynamics for assessing pelagic environmental changes in marine ecosystems is considered.